

A PHONOLOGY OF EASTERN KMHMU' WITH SPECIAL REFERENCE TO PALATAL CONTINUANT CODAS AND NEUTRALISATION OF VOWEL LENGTH CONTRAST¹

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Abstract

The eastern variety of Kmhmu' described in this study has a rich phoneme inventory of 36 consonants and 10 distinctive vowel qualities with contrastive vowel length. There is no contrast of vowel phonation or tone, although voicing and glottalisation do contrast in initial consonants. Word and syllable structure are described along with word formation patterns. Previous descriptions of this variety of Kmhmu' differ in their interpretation of the final voiceless palatal continuant and in their interpretation of vowel length preceding final /ʔ h j/ (Smalley 1961, Preisig 1990, Suksavang Simana et al. 1994 and Suwilai 2002). This study presents data and analysis which clarify these details. This analysis suggests that the voiceless palatal approximant in final position be interpreted as an approximant, rather than a fricative as others have analysed it, because it is realised with little turbulence. It also demonstrates how vowel length contrast is neutralised in syllables with final laryngeal consonants /ʔ h j/, where duration is consistently intermediate between long and short. The neutralisation of vowel length before final /j/ is thought to be due to the articulatory and auditory similarity to final /h/.

Keywords: Kmhmu', phonology, vowels
ISO 639-3 code: kjg

1 Introduction

There has been considerable linguistic research done on Kmhmu'. Smalley (1961) was one of the first linguists to produce a grammar of a Luang Prabang variety, including a detailed phonological and morphological description. Anthropological and linguistic studies in the Yuan variety have been conducted over some decades by researchers from Lund University, Sweden, including studies on phonology (Lindell et al. 1981, Svantesson 1983, 1989; Svantesson et al. 2014). Suwilai has published extensively on Kmhmu', including a descriptive grammar (1987), and her most recent work, a five-volume set including a dictionary of Kmhmu' in Laos, Thailand, Vietnam and China and a multi-dialect thesaurus (2002). Cooper & Cooper (1999) published a phonological description of a variety of Kmhmu' in Chiang Rai Province, Thailand. From within Laos the major contribution has been a dictionary of a Xieng Khouang variety (Suksavang Simana' et al. 1994). For a more comprehensive list of works on Kmhmu' see the bibliography by Cheeseman et al. (2017).

¹ This paper was originally accepted, after revisions, by two reviewers for publication in the Mon-Khmer Studies journal. However, as MKS was last published in 2016 (Issue 45) and is currently inactive, we have agreed to publish this article in JSEALS as the paper was previously reviewed and accepted by MKS, and we find the quality of the paper is sufficient and the data and hypotheses of notable value.

² The author wishes to acknowledge the linguistic and editorial input of Dr Sigrid Lew and Ryan Gehrman of the Linguistics Department, Payap University, Chiang Mai, Thailand, and the technical assistance of Annelies van der Lee, postgraduate linguistics student at Radboud University, Nijmegen, The Netherlands.

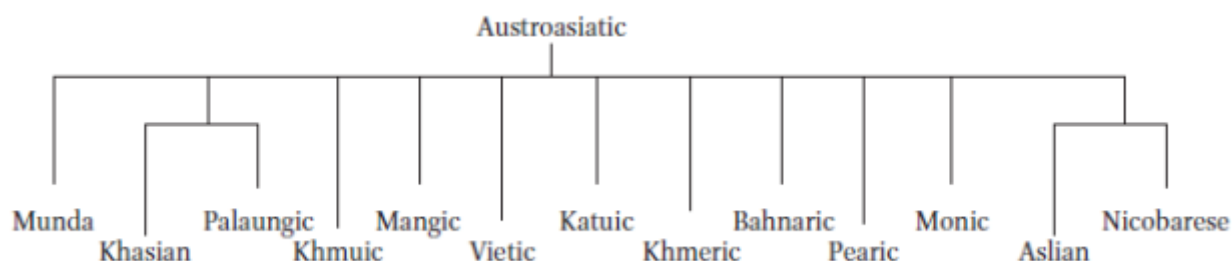
The phonological descriptions given in Smalley (1961), Preisig (1990:1-8), Suksavang Simana et al. (1994:49-63) and Suwilai (2002: 3.xxiv-xxxvii) differ in their interpretation of the final palatal approximant and vowel length preceding the laryngeal finals /ʔ h ɰ/. The final voiceless palatal approximant /j̥/ represents the Proto-Austroasiatic *-s. It has been variously described as a consonant cluster /jh/ (Smalley 1961:11), an aspirated palatal semi-vowel /jʰ/ (Preisig 1990:5; Suksavang et al. 1994:58), a voiceless palatal fricative /ç/ (Suwilai 2002:xxviii) and, in another variety of Kmhmu', a voiceless palatal approximant /j̥/ (Cooper & Cooper 1999:150). On the issue of vowel length, vowels of syllables with final /ʔ h ɰ/ have generally been characterised as short (Smalley 1961:5; Preisig 1990:7; Suksavang et al. 1994:58-59) or characterised as long in isolation and short in connected speech (Suwilai 1987:13,16). This study seeks to clarify these details through a phonological analysis of data elicited from Kmhmu' speakers from the Lao PDR.³ Examples are also taken from the Kmhmu'-Lao-French-English Dictionary (Suksavang Simana et al. 1994).

1.1 Kmhmu' linguistic background

There are over 700,000 speakers of the Kmhmu' language located mainly in the Lao PDR, Thailand, Vietnam, China and in migrant populations in France, the United States of America and Canada. In the Lao PDR, where most of the Kmhmu' live, they are located mainly in the northern and central provinces of Phongsali, Luang Nam Tha, Bokeo, Udomsay, Luang Prabang, Hua Phan, Xieng Khouang, Sayabuli, Vientiane and Bolikhamsay. Kmhmu' in Thailand live mainly in Nan and Chiang Rai provinces, with some smaller populations in Kanchanaburi, Uthaitani, and Lampang. There are also Kmhmu' located in Sipsong Panna Prefecture of Yunnan province in China, and in northern Vietnam.

Linguistically, Kmhmu' is in the Austroasiatic language phylum. Until recently, Austroasiatic languages were seen as divided into two principal clades, the Munda languages and the Mon-Khmer language family, and Kmhmu' was placed in the Khmuic branch of the Mon-Khmer family. This view has been challenged by Sidwell, who proposes a strongly-branching tree with 11 primary nodes (Sidwell 2008; Sidwell & Blench 2011; Sidwell 2015c), as shown in Figure 1.

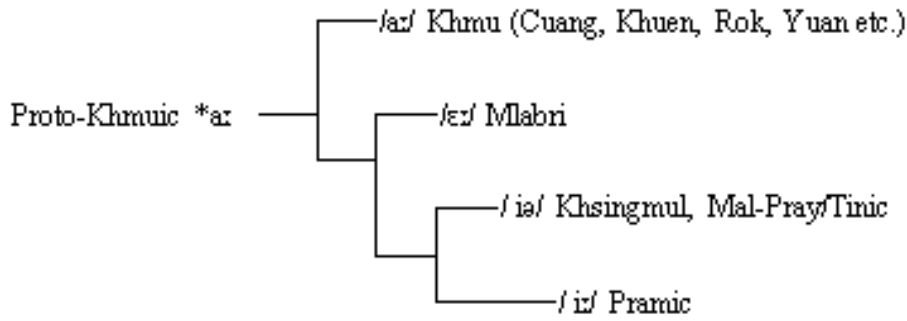
Figure 1: Provisional Austroasiatic classification (from Sidwell 2015c:179)



Khmuic forms one of these branches and includes Kmhmu' as by far the largest of the Khmuic languages, along with the smaller languages Mlabri, Khsing Mul, T'in/Mal/Pray, Puôc, Bit, Phong, Theen (Tai Then), Iduh (Tai Hat), Khang and Khabit. Research on the other languages and the internal structure of the Khmuic branch is ongoing, and the systems offered differ in structure relationships and even in the number of languages involved (Filbeck 1978; Proschan 1996; Chazée 1999; Peiros 2004; Sidwell 2009, 2014, 2015a, b, c).

Sidwell (2015c) has proposed a tree structure for the Khmuic branch based on his study of the historical sequence of phonological changes within Khmuic, shown in Figure 2.

³ The author wishes to thank her language consultants from Lao PDR, Mr. Vatsana Latsami from Khonkeo Village, Hin Heup District, Vientiane Province, Mr. Khamleey Loytisith from Pha Keng Hnam Village, Phu Khoun District, Luang Prabang Province, Miss Pang Vilay from Tao Thaan Village, Hin Heup District, Vientiane Province and Mrs Bounthan Keobounmanh from Hin Tit Village, Hin Heup District, Vientiane Province.

Figure 2: *Khmuic classification (from Sidwell 2015c:192)*

There are several distinct varieties of Kmhmu', falling into two main clusters, which we may refer to as Eastern and Western (Suwilai 2004). The major differences between varieties are of a lexical and phonological nature. The Eastern varieties have a rich initial consonant inventory including voicing opposition for both stops and sonorants, while the Western varieties have restructured the initial consonant voicing distinction into new contrasts of vowel phonation, tonality or a combination of the two. The Eastern variety cluster is spoken in Phongsali, eastern Udomsay, Luang Prabang, Hua Phanb, Xieng Khouang, Sayabuli, Vientiane and Bolikhamsay provinces in Lao PDR (Suksavang et al. 1994, Svantesson 1989), in Điện Biên Phủ, Sơn La and Nghệ An provinces in North Vietnam and some villages in Sipsongpanna (Xishuangbanna) in China (Suwilai 2002). The Western variety cluster is spoken in Luang Nam Tha, Bokeo and Udomsay provinces in Lao PDR, in Chiangrai and Nan provinces in Thailand, and in some villages in Sipsong Panna in China (Suksavang et al. 1994, Svantesson 1989, Suwilai 2002). Some varieties within each cluster have been studied in some detail, but there has been no comprehensive study to determine whether there are distinct boundaries between varieties or a continuum of varieties merging into one another across the Kmhmu'-speaking area.

This paper describes one of the Eastern varieties of Kmhmu' spoken in Vientiane, Luang Prabang, Xieng Khouang, and Bolikhamsay provinces in Laos, sometimes known as Kmhmu' Am, Kmhmu' Cwang or Kmhmu' Ou. By far the largest of the groups (perhaps as many as two thirds of the 700,000 plus Kmhmu' speakers), it is also considered the most widely understood across the Kmhmu' speaking community and is hereafter referred to as Kmhmu'.

2 Kmhmu' word and syllable structure

The maximal word template for Kmhmu' can be expressed as follows: ((C_iC_f).C_i(V)(C_f)).C_i(C_m)V(C_f). Words may be monosyllabic, disyllabic iambs or less frequently, trisyllabic anapaests. The final syllable, known as the major syllable, is always stressed and is phonotactically unrestricted compared with non-final syllables. Monosyllables are equivalent to major syllables of polysyllabic words. Penultimate and antepenultimate syllables, known as minor syllables or pre-syllables, are reduced in length and intensity and are phonotactically restricted compared with major syllables. Trisyllables are typologically unusual for languages in the area and in Kmhmu' only occur when either the causative prefix *p(C)-* or the nominalising prefix *ɲ-* is added to a disyllable. Examples of permissible word shapes are shown in Table 1.

Table 1: *Kmhmu' word structure*

	Major syllable shape			
	C _i V	C _i C _m V	C _i VC _f	C _i C _m VC _f
Monosyllabic	<i>ga:</i> 'to climb'	<i>kʰrɔ:</i> 'to request'	<i>ter</i> 'to jump'	<i>ble:k</i> 'eel'
Disyllabic	<i>cɛ.lɛ:</i> 'narrow spade'	<i>sɛ.grə:</i> 'lemon grass'	<i>cɛ.mɔ:l</i> 'to dabble'	<i>pɛ.grəŋ</i> 'equally'
	<i>pn.bɛ:</i> 'to exploit'	<i>pn.blia</i> 'to beautify'	<i>km.nu:n</i> 'to kneel'	<i>pk.la:k</i> 'to deceive'
Trisyllabic	-	<i>pn.hn.dri:</i> 'to disarrange'	<i>pn.sɛ.gar</i> 'to straighten' <i>ɲj.km.nɜ:m</i> 'gift'	<i>pn.lɛ.druaj</i> 'to appease' <i>pn.hm.pʰrah</i> 'to cause to open'

In major syllables with a complex onset, there are predictable patterns which govern whether an initial consonant sequence is realised as a cluster or has a vocoid transition, symbolized in this paper as v . Prevocalic sequences of obstruent+/r/ are always realised as complex onsets of a monosyllable (e.g. /briʔ/ [briʔ] ‘forest’). The same is true of prevocalic sequences of bilabial or velar obstruent+/l/or/w/ (e.g. /pleʔ/ [pleʔ] ‘fruit’, /glək/ [glək] ‘bamboo bowl’, /kwa:j/ [kwa:j] ‘tuber’). However a sequence of coronal obstruent +/l/or/w/ is always realised with a vocoid transition (e.g. /cɛ.lɔ:ŋ/ [cɛ̃.‘lɔ:ŋ] ‘boat’, /tɛ.wa:ŋ / [tɛ̃.‘wa:ŋ] ‘interval of time’), as are all other prevocalic CC combinations (e.g. /pɛ.teʔ/ [pɛ̃.‘teʔ] ‘earth’). Even so, my analysis of such C_v sequences in this dialect of Kmhmu' at present is that they are true minor syllables, as explained below.

2.1 Minor syllables

There are two types of minor syllables in Kmhmu'; namely those with a vocalic rhyme, C_iV , and those with a consonantal rhyme C_iC_f , but none with both. In CC minor syllables the consonant coda is typically a liquid or nasal sonorant /r l m n ŋ/, except in cases which exhibit coda-reduplicating infixation (see 3.5 Minor syllable codas), in which case an approximant /w j/ or an obstruent /p t c k/ may also occur as C_f . If C_f is a sonorant, the sonorant constitutes the syllable nucleus as a syllabic consonant, e.g. /tm.bɔʔ/ [tm̩.bɔʔ] ‘to add’. If C_f is an obstruent a vocalic transition is always inserted after the initial consonant, e.g. /rk.bak/ [r̩k.bak] ‘saddle’.

In a diachronic perspective, it is apparent that the language is slowly progressing to monosyllabic word structure, with the accompanying progressive reduction of the vowel contrastivity and quality in the minor syllable. But at this point in time in this particular variety of the language, my analysis indicates that there are still C_iV minor syllables in Kmhmu'. There are a few cases of minor syllable vowel unpredictability that point to this.

In general, minor syllable vowel quality is non-contrastive, most often being realised as the close central vowel [ɨ], e.g. /kɛ.mu:l/ [kɛ̃.‘mu:l] ‘silver’. In a few instances, however, unpredictable variation in minor syllable vowel quality is found as in the minimal pair /hɛ.ʔiar/ ‘chicken’ which is invariably realised as [hɛ̃.‘ʔiar], and /hɛ.ʔia/ ‘sweet’ which is invariably realised as [hɛ̃.‘ʔia]. There is also dialectal variation, e.g. /hɛ.ʔeʔ/ [hɛ̃.‘ʔeʔ]~[hɛ̃.‘ʔeʔ] ‘firewood’. If you use the [hɛ̃.‘ʔeʔ] pronunciation with a [hɛ̃.‘ʔeʔ] variety speaker, you will be firmly corrected. These examples, though few, clearly point to an underlying vowel quality in the mind of the speaker.

Another factor that points to C_iV minor syllables is the restriction placed on C_i . In her study on Khmer and Bunong, Butler (2015) finds that Khmer does not have true minor syllables, but rather phonological monosyllables with excrescent transitions. This analysis is supported by the absence of restrictions on the inventory of C_1 in C_1vC_2VC sequences compared with the restricted inventory of consonants permissible in minor syllables which have a consonant coda. In Khmer, C_1 may be any of the initial consonants found in monosyllables. While in Bunong, which Butler analyses as having true minor syllables, she finds that C_1 in both C_1vC_2VC and $C_1vC_2.C_3VC$ sequences has the reduced segmental inventory characteristic of minor syllables. In Kmhmu' there is likewise a restriction on C_i in both C_iV minor syllables (C_1vC_2VC sequences) and C_iC_f minor syllables ($C_1vC_2.C_3VC$ sequences); namely p t c k r l s h, compared with the 36 initial consonants found in monosyllables.

Both this restriction on C_1 in C_1vC_2VC sequences along with the unpredictability of vowel quality in a few cases together support an analysis of C_iV minor syllables in Kmhmu'.

3 Kmhmu' consonant inventory

Kmhmu' has a rich phoneme inventory including 36 consonants.

3.1 Major syllable onsets

Major syllables allow all 36 consonant phonemes as onsets, as shown in Table 2.

Table 2: Major syllable onsets

	bilabial	alveolar	palatal ⁴	velar	glottal
Oral stops	<i>p^h p b</i>	<i>t^h t d</i>	<i>c^h c ɟ</i>	<i>k^h k g</i>	<i>ʔ</i>
Nasal stops	<i>ṃ ṁ m</i>	<i>ṇ ṇ n</i>	<i>ɲ ṇ</i>	<i>ŋ ṁ ṁ</i>	
Approximants	<i>ɰ ʷ w</i>		<i>j ʝ j</i>		
Fricatives		<i>s</i>			<i>h</i>
Laterals		<i>ɭ l</i>			
Trills		<i>ʀ r</i>			

Oral and nasal stops at bilabial, alveolar, palatal and velar places of articulation show three distinctive laryngeal settings, with the exceptions of a gap for the pre-glottalised palatal nasal /ʎṇ/. Voiceless unaspirated stops are phonetically stiff voiced, bringing them in-line with the glottalised sonorants. Approximants at labio-velar and palatal places of articulation also show three distinctive laryngeal settings. The alveolar liquids /l r/ show only two phonation types, voiced and voiceless. Note that the glottalised liquids, which we might expect based on principles of phonological symmetry, are not found. In the onset of major syllables the rhotic is in free variation between a flap and a trill. Only the alveolar sibilant /s/ shows no voicing contrast. Kmhmu' also has a glottal stop and a voiceless glottal fricative. In initial position voiceless sonorants are accompanied by a brief voiced transition into the following vowel.

There is some inter-speaker variation for the voiceless labio-velar approximant /ɰ/, which can be realised as a voiceless labiodental fricative [f]. Since this sound is part of the Lao phoneme inventory, this inter-speaker variation is probably due to language contact. Similarly, the voiced labio-velar approximant /w/ is in free variation with the labiodental approximant [v], which is also a Lao phoneme, for example /sq.waʔ/ [sq.'waʔ]~[sq.'vaʔ] 'spider'.

3.2 Major syllable medial consonants

Medial consonants occur following the initial consonant in a major syllable. Clusters are formed with voiced liquids /l r/ or the labio-velar /w/ approximant following a stop, or with the rhotic /r/ following /s//c^h/, for example *gleʔ* 'husband', *kwa:l* 'to bark', *sreh* 'sand'. A noteworthy restriction is that medial /r/ does not co-occur with voiceless unaspirated initial stops, namely /pr, tr, cr, kr/. There are also phonotactic constraints such that /l/ does not occur with coronal consonants, and /w/ only occurs with velars. The rhotic is realised as a flap in consonant clusters. Examples of consonant clusters are shown in Table 3.

⁴ The palatal obstruents are articulated in the alveolopalatal position, which is pronounced with the part of the tongue just behind the blade and articulating against the roof of the mouth at the front of the hard palate, further forward than palatal sounds, as described by Pullum and Ladusaw (1996:33, 204). This is true of palatal obstruents in all phonotactic positions, not just major syllable onsets.

Table 3: Consonant clusters

Initial consonant	l		r		w	
p ^h	-		<i>p^hria</i>	‘fire’	-	
p	<i>plɔːŋ</i>	‘calf’ (of leg)	-		-	
b	<i>bluʔ</i>	‘thigh’	<i>briʔ</i>	‘forest’	-	
t ^h	-		<i>t^hriːk</i>	‘frog’	-	
d	-		<i>druŋ</i>	‘termite’	-	
s/c ^{h5}	-		<i>sroʔ/c^hroʔ</i>	‘to speak’	-	
ɟ	-		<i>ɟruʔ</i>	‘deep’	-	
k ^h	-		<i>k^hraŋ</i>	‘to laugh’	<i>k^hwɛːn</i>	‘to be better’
k	<i>klɔːŋ</i>	‘seed’	-		<i>kwaːl</i>	‘to bark’
g	<i>gleʔ</i>	‘husband’	<i>graŋ</i>	‘hard’	<i>gwɛːŋ</i>	‘beam of wood’

3.3 Major syllable codas

The inventory of consonants for major syllables codas is more restricted than for onsets, with only 15 consonants occurring in codas, as shown in Table 4. The laryngeal contrasts seen in onsets are neutralised in codas, possible codas including only unreleased voiceless oral stops, voiced nasal stops, voiced liquids /l r/, the voiced labio-velar approximant /w/ and the voiceless glottal continuant /h/. The exception is the palatal approximant, which occurs as voiced and voiceless /j ɟ/. This asymmetry is explained by /j/ being the modern reflex of the Proto-Austroasiatic voiceless fricative *s-, as discussed below (Sidwell & Rau 2015).

Table 4: Major syllable codas

	bilabial	alveolar	palatal	velar	glottal
Oral stops	<i>p</i>	<i>t</i>	<i>c</i>	<i>k</i>	<i>ʔ</i>
Nasal stops	<i>m</i>	<i>n</i>	<i>ɲ</i>	<i>ŋ</i>	
Approximants	<i>w</i>		<i>j ɟ</i>		
Fricatives					<i>h</i>
Laterals		<i>l</i>			
Trills		<i>r</i>			

All syllable-final plosives are voiceless and unreleased. The palatal stop is preceded by a palatal off-glide e.g. /buːc/ [buːt̚] ‘liquor’. In major syllable codas the voiced lateral has a short voiced stop transition preceding the lateral release. The rhotic is consistently realised as a trill in word final position.

The voiceless palatal approximant /ɟ/ in final position is realised with little turbulence and so is analysed as an approximant, rather than a fricative as it was described by Suwilai (2002:xxviii). An analysis of this sound as a cluster (Smalley 1961:11) is inconsistent with the restriction of the coda to single final consonants observed otherwise. In final position, /h j/ show articulatory and auditory similarity. The difference in their places of articulation is manifested in the vowel transition heard as the tongue moves to the palatal position for /j/ final syllables e.g. /kah/ [kah] ‘to untie’, /kaɟ/ [kaɟ̚] ‘to put away’. This analysis is consistent with Sidwell and Rau’s (2015) discussion of the phonetics of the reflexes of Proto-Austroasiatic *-s cross-linguistically, where they state that this coda is reflected in some languages as a palatal approximant /j/ with a clearly audible vowel transition preceding it.

⁵ There is dialectal variation between /sr/ and /c^hr/. The /sr/ pronunciation is more widespread throughout Eastern Kmhmu’ varieties, while the /c^hr/ pronunciation is used in clans living in or originating from Muang Khoun in the central part of Xiang Khouang province. (Elisabeth Preisig personal communication)

3.4 Minor syllable onsets

Minor syllables show a reduced consonant inventory with only 12 initial consonants: /p^h t d c k g m l r s h/. Most commonly, minor syllable onsets are voiceless plosives /p t c k/, voiced liquids /l r/, and fricatives /s h/, e.g. *cm.kin* ‘female’, *lɛ.ɲɪn* ‘dark’, *ɲɪ.mah* ‘food’. The less common onsets are found in words formed by coalescence of earlier compounds (e.g. *gə* ‘3sg’ + *mə?* ‘who?/where?’ → *gɛ.mə?* ‘which?’), or in expressives (e.g. *mɛ.lam mɛ.lɔːj* ‘disreputably’). The rhotic is realised as a flap in the onset of minor syllables.

3.5 Minor syllable codas

There are two types of minor syllable codas; those that occur freely with any main syllable and those that only occur in words formed by coda-reduplicating morphology (Svantesson & Holmer, 2015). The former are more common and consist of voiced liquids /r l/ e.g. *kr.wa?* ‘cocoon’, *kl.jɔːɲ* ‘to swim’, or one of three voiced nasals /m n ɲ/ which is generally homorganic with the major syllable onset, *km.bra?* ‘wife’, *sn.dɛh* ‘bowl’, *pɲ.ga?* ‘embarrassed’ (see discussion under Phonological Processes in Minor Syllables). The rhotic is realised as a flap in the coda of minor syllables.

Less common codas are formed by coda-reduplicating morphology, where the minor syllable coda of a prefix assimilates to the coda of the root. These codas include the voiced palatal nasal /ɲ/, voiceless plosives /p t c k/ and the voiced approximants /w j/. Examples of such coda-reduplicating morphology are found in the prefixation of the causative prefix, *p(C)-*, and the nominalising prefix, *rC-*. The most common form of the causative prefix is *pn-*, but several examples of coda-reduplicating morphology are found, e.g. *tok* ‘to peck’ (of chickens) + *p(C)-* → *pk.tok* ‘to feed’ (chickens). The coda of the nominalising prefix *rC-* is most commonly realised as a homorganic nasal, but some examples of coda-reduplicating morphology are found, e.g. *bak* ‘to ride’ + *rC-* → *rk.bak* ‘saddle’. Other instances are seen in the formation of expressives, e.g. *kp.jəp* ‘cloudy, threatening’ (of weather) and *lj.druaj* ‘distressed to the point of exhaustion’. The morphology of expressives is more extensively dealt with in Svantesson (1983).

3.6 Phonological processes in minor syllables

There are several phonological processes that are found only in minor syllables. The contrast between certain consonants is neutralised in this environment, as seen in initial fricative variation, liquid variation and final nasal assimilation.

1. Initial fricative variation is seen for /s/ and /h/ in some minor syllables, e.g. *ɲɪ.gɔːɲ~hɲ.gɔːɲ* ‘soup’; *sn.dɛh~hn.dɛh* ‘bowl’.
2. Variation between initial liquids /l/ and /r/ in minor syllables can occur along with dissimilation in the final liquid of the major syllable, e.g. *lɛ.ɲar~rɛ.ɲal* ‘bone marrow’. Variation is also seen between final /l/ and /r/ in some minor syllables, e.g. *kl.jaːt~kr.jaːt* ‘to drool’.
3. In most minor syllable final nasals, the place of articulation assimilates to a following obstruent, e.g. *lm.bo?* ‘cow’, *hn.drəːj* ‘wind’, *hɲ.kir* ‘thunder’. There are several exceptions to this general pattern, e.g. *pm.giː* ‘tomorrow’, *sm.tɔːɲ* ‘stretched out (of legs)’, *rɲ.dɔːɲ* ‘steps/ladder’. The nasal coda of the nominalising prefix *ɲɪ-* does not assimilate to the major syllable onset, e.g. *blia* ‘beautiful’, *ɲɪ.blia* ‘something beautiful’; *dɪːm* ‘to believe’, *ɲɪ.dɪːm* ‘beliefs’; *cu?* ‘to hurt’, *ɲɪ.cu?* ‘pain’; *gɔːɲ* ‘to make soup’, *ɲɪ.gɔːɲ* ‘soup’. Similarly, when the causative prefix *p(C)-* has a nasal coda, it generally does not assimilate to the major syllable onset, e.g. *biːt* ‘to go out (fire)’, *pn.biːt* ‘to extinguish’; *jə?* ‘dirty’, *pn.jə?* ‘to make dirty’; *gem* ‘salty’, *pn.gem* ‘to make salty’.

4 Kmhmu' vowel inventory

Kmhmu' has 10 distinctive vowel qualities, all of which occur in both short and long forms. This gives a total of 20 vowel phonemes, as shown in Table 5. There are three sets of front, central, and back vowels with close, close-mid and open-mid tongue height, as well as an open central vowel. The front vowels are spread, the central vowels are neutral, and the back vowels are rounded. All three close vowels can form diphthongs with the open central vowel as a target vowel: /ia/, /ɪa/, and /ua/, for example *riah* ‘root’, *pɛ.siam* ‘night’, and *sruat* ‘morning’.

Table 5: *Kmhmu'* vowels

	front unrounded	central unrounded	back rounded
close	<i>i i:</i>	<i>ɪ ɪ:</i>	<i>u u:</i>
close-mid	<i>e e:</i>	<i>ə ə:</i>	<i>o o:</i>
open-mid	<i>ɛ ɛ:</i>	<i>ɜ ɜ:</i>	<i>ɔ ɔ:</i>
open		<i>a a:</i>	
diphthongs	<i>ia</i>	<i>ia</i>	<i>ua</i>

The front and back vowels show three vowel heights, but in the central vowels four vowel heights are found. The open-mid central unrounded vowel /ɜ/ is contrasted with the other central vowels as seen in the following examples, *dɪ:m* ‘to believe’, *²nə:m* ‘retribution’, *²nɜ:m* ‘Imperative particle’, and *²na:m* ‘amount’.

If diphthongs precede a final palatal consonant, there is fronting of the target vowel [a] to [ɛ], as the active articulator prepares for the palatal closure, for example /kliac/ [kliɛt̚] ‘bald’.

Vowel length in closed syllables is phonologically contrastive in all 10 vowel qualities. Examples are shown in Table 6.

Table 6: *Contrastive vowel length examples*

Vowel quality	Short		Long	
i	<i>pin</i>	‘to spin’	<i>pi:n</i>	‘to turn over’
e	<i>kep</i>	‘to cut’ (with scissors)	<i>ke:p</i>	‘cheek’
ɛ	<i>dɛk</i>	‘a little’	<i>dɛ:k</i>	‘to measure’
ɪ	<i>kit</i>	‘thick forest’	<i>ki:t</i>	‘to use as a lever’
ə	<i>mək</i>	‘ink, tattoo’	<i>mə:k mə:k</i>	‘to daydream’
ɜ	<i>dɜn</i>	‘protruding slightly’	<i>dɜ:n</i>	‘cute smile’
a	<i>pat</i>	‘duck’	<i>pa:t</i>	‘to cut apart’
u	<i>put</i>	‘to extinguish’	<i>pu:t</i>	‘cloud’
o	<i>pok</i>	‘to bite’	<i>po:k</i>	‘knob on a tree’
ɔ	<i>ʔɔk</i>	‘chest’	<i>ʔɔ:k</i>	‘goitre’

4.1 Vowels in minor syllables

In minor syllables with vocalic rhymes, the vowel quality is generally non-contrastive, most often being realised as the close central vowel [ɪ] and occasionally showing variation between [i~ə~e] in harmony with the height of the vowel in the major syllable, e.g. /sɛ.ʔɔ:ŋ/ [sɛ.ʔɔ:ŋ] ‘wood’. As discussed in 2.1 Minor syllables, very rare unpredictable variation in minor syllable vowel quality is found as in the minimal pair /hi.ʔiar/ ‘chicken’ and /ha.ʔia/ ‘sweet’. There is also dialectal variation in the quality of the central vowel in minor syllables, e.g. /hɛ.ʔeʔ/ [hɛ.ʔeʔ]~[hɛ.ʔeʔ] ‘firewood’.

Minor syllables with consonantal rhymes in most cases have a syllabic sonorant consonant and thus no vowel, e.g. /cm.brɔʔ/ [tɕm.ʔbrɔʔ] ‘male’. In those much less common cases where there is an obstruent coda, an epenthetic vowel is inserted after the initial consonant. This vowel is predictably a close central vowel that is reduced in both quality and quantity, e.g. /pk.tak/ [pʰk.ʔtak] ‘to attach’.

5 Kmhmu' word formation patterns

Kmhmu' is a predominantly isolating language with no inflectional morphology. Compounding is a productive process for word formation. There is some derivational morphology using prefixes and an infix. Word formation is governed by the canonical word structure of Kmhmu' consisting of a heavy or major syllable with the possibility of one or two minor syllables preceding it. When affixation, reduplication, or compounding occurs, the resulting derived word must follow the established syllable canon for the language. A full exploration of derivational morphology in Kmhmu' is beyond the scope of this paper, but see discussion in Svantesson (1983).

5.1 Compounding

When compounds are formed, in order to retain the canonical word structure, the first element becomes similar to a minor syllable. The vowel length is shortened although there is often some retention of vowel quality. In careful speech or in written form the separate words are maintained, while in normal speech they take the rhythmic pattern of a disyllabic iamb. E.g. *maʔ* 'mother' + *ʔe:m* 'wife's brother' → *mɐ.ʔe:m* [mɐ.ʔe:m] 'wife of mother's brother'.

5.2 Prefixation

The four prefixes found in Kmhmu' are a productive nominalising prefix, *sŋ-*,⁶ a less productive nominalising prefix, *rN-*, a resultative state prefix with the forms *tL-*,⁷ *hN-*, and a causative prefix, *p(C)-*.

The place of articulation of the nasal coda of the nominalising prefix, *sŋ-*, does not usually vary as might be expected by assimilation to the place of articulation of the following C, although some exceptions have been noted. On the other hand, the nominalising prefix, *rN-*, and the nasal-final forms of the resultative state prefix, *hN-*, both show place assimilation of the final nasal to the following C.

The causative prefix, *p(C)-*, is highly productive. By far the most common form is *pn-* (74% of 423 examples), which is the only form that attaches to disyllabic stems. The next most common form is *p-*. Some very few examples of causative prefixes with *t,k* or *l,ŋ* codas are found. Stop codas only occur in coda-reduplicating morphology with their respective stems, e.g. *ja:t* 'to drool', *pt.ja:t* 'to cause to drip'; *tok* 'to peck', *pk.tok* 'to feed(chickens)'. Some very few examples of coda-reduplicating morphology are also found with final *ŋ*, e.g. *riŋ* 'to endure', *pŋ.riŋ* 'to restrain oneself'. As mentioned under Phonological Processes in Minor Syllables, in the majority of instances the nasal coda of the causative prefix does not assimilate to the onset of the stem. But some examples of dialectal variation between the nasals are found, e.g. *granj* 'hard, strong', *pn.granj*–*pŋ.granj* 'to stiffen'. Examples are shown in Table 7.

Table 7: Examples of prefixation

<i>mah</i>	'to eat'	+ sŋ- NOM →	<i>sŋ.mah</i>	'food'
<i>cuʔ</i>	'to hurt'	+ sŋ- NOM →	<i>sŋ.cuʔ</i>	'suffering'
<i>ka:r</i>	'to grill'	+ sŋ- NOM →	<i>sŋ.ka:r</i>	'grilled food'
<i>sɐ.lah</i>	'to be surplus'	+ sŋ- NOM →	<i>sŋ.sɐ.lah</i>	'remainder'
<i>bɔʔ</i>	'to carry on back'	+ rN- NOM →	<i>rm.bɔʔ</i>	'backpack straps'
<i>sih</i>	'to lie down'	+ rN- NOM →	<i>rn.sih</i>	'bed'
<i>ga:t</i>	'to attach rungs to a tree'	+ rN- NOM →	<i>rŋ.ga:t</i>	'ladder rungs'
<i>pak</i>	'to break'	+ tL- RES →	<i>tl.pak</i>	'broken'
<i>bah</i>	'light'	+ tL- RES →	<i>tr.bah</i>	'radiant'
<i>pa:ŋ</i>	'to open'	+ hN- RES →	<i>hm.pa:ŋ</i>	'opened'
<i>ca:k</i>	'to tear'	+ hN- RES →	<i>hn.ca:k</i>	'torn'
<i>griaŋ</i>	'to dig up'	+ hN- RES →	<i>hŋ.griaŋ</i>	'uprooted'
<i>duʔ</i>	'to leave'	+ p(C)- CAUS →	<i>pɐ.duʔ</i>	'to drive out'
<i>tok</i>	'to peck'	+ p(C)- CAUS →	<i>pk.tok</i>	'to feed (chickens)'
<i>wə:c</i>	'to remove over the head'	+ p(C)- CAUS →	<i>pl.wə:c</i>	'to remove over someone else's head'
<i>mah</i>	'to eat'	+ p(C)- CAUS →	<i>pn.mah</i>	'to feed'
<i>gə:j</i>	'to be used to'	+ p(C)- CAUS →	<i>pn.gə:j</i>	'to train to get used to'
<i>hŋ.koʔ</i>	'to put on' (shirt)	+ p(C)- CAUS →	<i>pn.hŋ.koʔ</i>	'to dress (someone else)'
<i>sɐ.gar</i>	'straight'	+ p(C)- CAUS →	<i>pn.sɐ.gar</i>	'to straighten'
<i>ja:t</i>	'to drool'	+ p(C)- CAUS →	<i>pt.ja:t</i>	'to cause to drip'

NOM = nominalising prefix; RES = resultative state prefix; CAUS = causative prefix

⁶ For a fuller discussion of *sŋ* see Osborne 2009:36.

⁷ L is used here as a generic symbol for liquids.

As mentioned above, prefixes take the shape of minor syllables, e.g. *mah* 'to eat' + *ɲɛ-* nominalising prefix → *ɲɛ.mah* 'food'. When a prefix is added to a disyllabic iamb, the resultant word has 2 minor syllables. E.g. *hɲ.koʔ* 'to put on' (shirt) + *p(C)-* causative prefix → *pn.hɲ.koʔ* 'to dress (someone else)'. In Kmhmu' this is only found with the causative prefix *pn-* or the nominalising prefix *ɲɛ-*. Costello (1966) describes a similar trisyllabic pattern with derivational prefixation in Katu.

5.3 Infixation

The nominalising (or instrumental) infix found in Kmhmu' takes the forms *-rn-*, *-r-*, *-n-*. The most common form is *-rn-*, which is added to monosyllabic stems with simple onsets, such that *-r* becomes the coda of the minor syllable and *n-* becomes the onset of the major syllable in the resulting word, e.g. *hi:p* 'to spoon out' + *-rn-* → *hr.ni:p* 'spoon'.

When a monosyllabic stem has a complex onset, the infix has the form *-r-* which is inserted after *C₁* to become the coda of the minor syllable, and *C₂* becomes the onset of the major syllable, e.g. *klam* 'to carry on shoulder' + *-r-* → *kr.lam* 'carrying pole'. A similar pattern is seen with disyllabic stems when the minor syllable has no coda, where *-r-* is inserted as the coda of the minor syllable, e.g. *cv.mɔ:l* 'to dabble' + *-r-* → *cr.mɔ:l* 'dabble stick'. The infix is not seen with disyllabic stems with a minor syllable coda.

If the complex onset in a monosyllabic stem contains *r*, the infix has the form *-n-*, which becomes the coda of the minor syllable. In order to facilitate pronunciation of the *r* onset in the resulting major syllable, an excremental [d] is inserted, e.g. *grat* 'to measure' + *-n[d]-* → *kn.drat* 'measuring scoop'. This morphophonemic process is also seen in Katuic languages (Sidwell 2005). One instance of this process is also found with a simple onset stem, *kɔ:r* 'to flow' + *-n[d]-* → *kn.dɔ:r* 'bamboo water pipe'.

Morphophonemic changes, such as devoicing or de-aspiration of minor syllable onsets, occur during the affixation process to comply with constraints of the minor syllable, e.g. *jriah* 'to comb' + *-n[d]-* → *cn.driah* 'comb'. Examples of infixation are shown in Table 8.

Table 8: Examples of infixation

<i>pɔʔ</i>	'to sweep'	+ <i>-rn-</i> →	<i>pr.nɔʔ</i>	'broom'
<i>tam</i>	'to beat (a gong)'	+ <i>-rn-</i> →	<i>tr.nam</i>	'beating sticks'
<i>ma:n</i>	'to bury'	+ <i>-r-</i> →	<i>hr.ma:n</i>	'cemetery'
<i>jriah</i>	'to comb'	+ <i>-n[d]-</i> →	<i>cn.driah</i>	'comb'

6 Vowel length neutralisation

In order to address the question of what is the relative vowel length in syllables with final laryngeal consonants /ʔ h ɰ/ compared with contrastive long and short vowels in other syllables, recordings were made of a list of Kmhmu' words.

Data for analysis of vowel length were chosen in sets of words with matching or phonetically similar onset and vowel quality, and varying with respect to vowel length and coda. As far as was possible, each set included words with an open syllable (V:), long vowel and stop coda (V: stop), short vowel and stop coda (V stop), long vowel and sonorant coda (V: son), short vowel and sonorant coda (V son), /ʔ/ coda (Vʔ), /h/ coda (Vh) and /ɰ/ coda (Vɰ), e.g. *ka:* 'brave', *ka:p* 'chin', *kak* 'gelatinous', *ka:l* 'before', *kal* 'to measure', *kaʔ* 'fish', *kah* 'to untie', *kaj* 'to put away'. Eight sets of monothongs were chosen, a total of 66 words. Five sets of diphthongs were chosen, a total of 19 words, bringing the total to 85 words. Because many of the diphthong sets were incomplete particularly with respect to final /ʔ/ /h/ and /ɰ/, another 12 words were chosen apart from the matching sets to make a total of 31 words with diphthongs and 97 words in all. (See Appendix A: Initial Wordlist and Appendix B: Additional Wordlist)

The initial 85 words were recorded in one session with the native speaker Mrs Bounthanh Keobounmanh, aged 40, from Hin Tit Village, Hin Heup District, Vientiane Province. The additional 12 words were recorded at a later date with the same speaker. Data were elicited by a written list of words in Lao which the speaker had previously studied. Each word was spoken four times; the first, second and fourth times in isolation and the third time in a frame.

Vowel lengths for each recording were measured using Praat, and averages calculated for the three utterances spoken in isolation for each word. These were grouped by syllable type, e.g. V:, and an average calculated for each grouping, in order to establish the relative vowel length. Vowels in V: son syllables, 316

(243-364)ms, were slightly longer than in V: stop syllables, 273 (243-292)ms, but largely overlapping and so close that these groups were combined for purposes of analysis. Similar groupings were also made for words recorded in a frame and average vowel lengths calculated.

For major syllables vowel length is phonologically contrastive in closed syllables with monophthongs. This vowel quantity contrast is neutralised in three syllable types:

1. open syllables with either monophthongs or diphthongs;
2. closed syllables with diphthongs;
3. syllables ending with /ʔ h ɰ/.

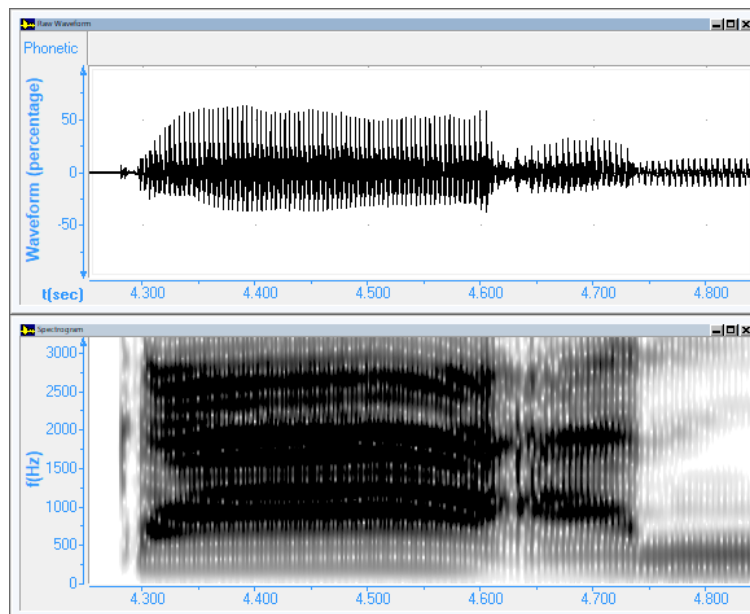
Measurements of vowel length in different syllable types recorded with words in isolation are given in Table 9.

Table 9: Average vowel length in milliseconds (range) for words in isolation

Syllable type	Monophthongs	Diphthongs
open	505 (474-533)	526 (509-551)
closed long	295 (243-364)	292 (263-353)
closed short	158 (101-200)	–
-ʔ	277 (251-309)	308 (272-333)
-h	218 (192-235)	278 (226-305)
-ɰ	254 (182-225)	259 (228-292)

Vowels in open syllables are always long, on average 505 ms⁸ for monophthongs and 526 ms for diphthongs; longer than in any other syllables. See Figure 3 for waveform and spectrogram of the open syllable *ka*:

Figure 3: Waveform and spectrogram for *ka*:



⁸ Measurements given for monophthongs are an average of a minimum of 21 recordings of words in isolation.

Monophthongs in closed syllables show contrastive length, with long vowels averaging 295 ms and short vowels 158 ms. See Figures 4 and 5 for waveforms and spectrograms of long and short vowels in closed syllables, *ka:p* and *kak*.

Figure 4: Waveform and spectrogram for *ka:p*

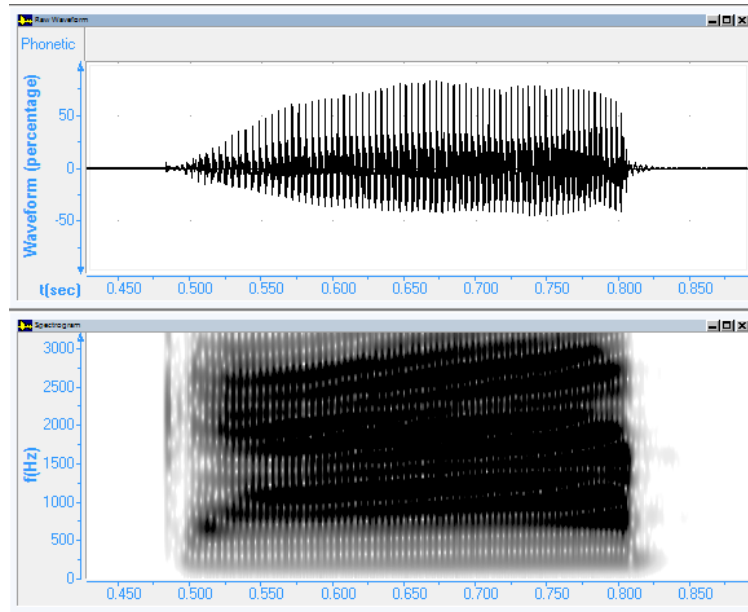
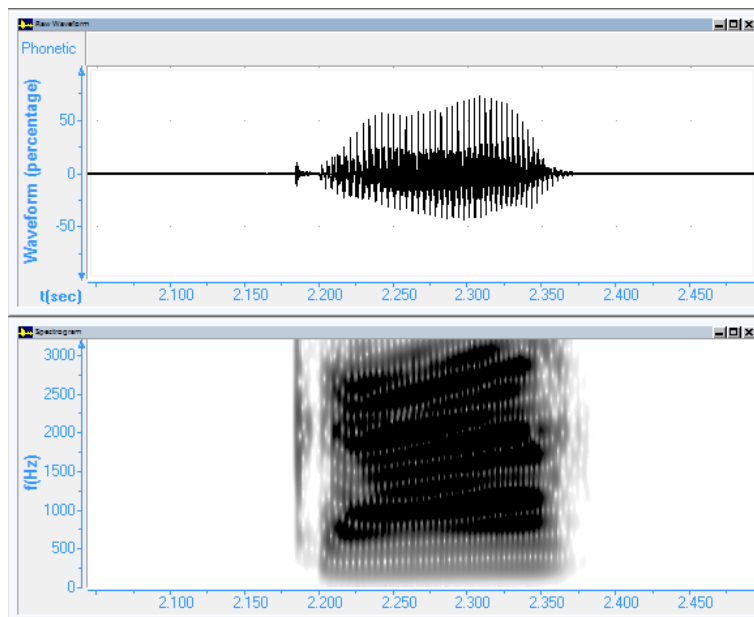


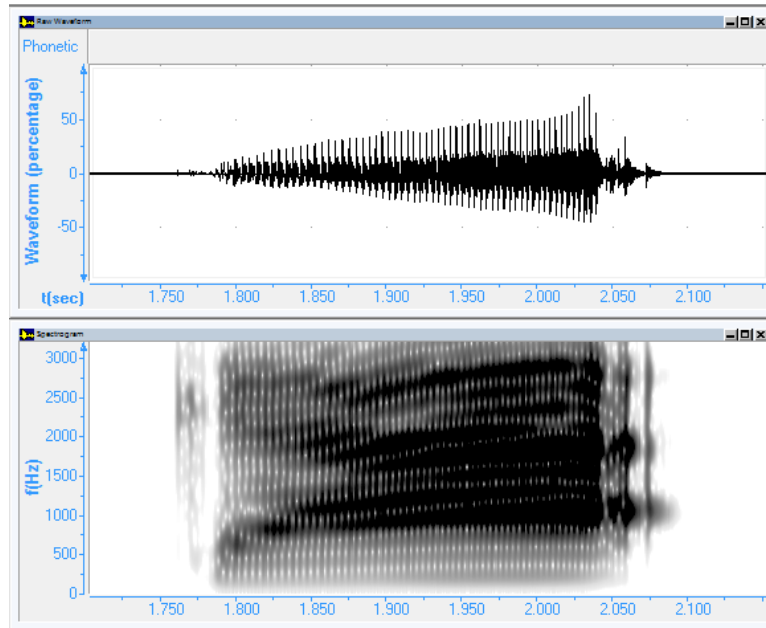
Figure 5: Waveform and spectrogram for *kak*



There is no length contrast for diphthongs in closed syllables.

Syllables with final laryngeal consonants /ʔ h j/ show no vowel length contrast. The duration of glottal stop final syllables, although showing no vowel length contrast, lies within the range of the long closed syllables. So although the average duration is intermediate, it is much closer to long than short. See Figure 6 for waveform and spectrogram of the glottal stop final syllable *kaʔ*.

Figure 6: Waveform and spectrogram for *kaʔ*



Vowel duration for final /h j/ is consistently intermediate between long and short, but closer to long than short, with the upper end of the range of /j/ overlapping with the lower end of the long vowel range. Although it might be expected that syllables with final /j/ would show contrastive vowel length like those with the other approximants /w j/, this is not seen. The neutralisation of vowel length with final /j/ is thought to be due to the articulatory and auditory similarity to the glottal continuant /h/. See Figures 7 and 8 for waveforms and spectrograms of the /h/ and /j/ final syllables *kah* and *kaj*.

Figure 7: Waveform and spectrogram for *kah*

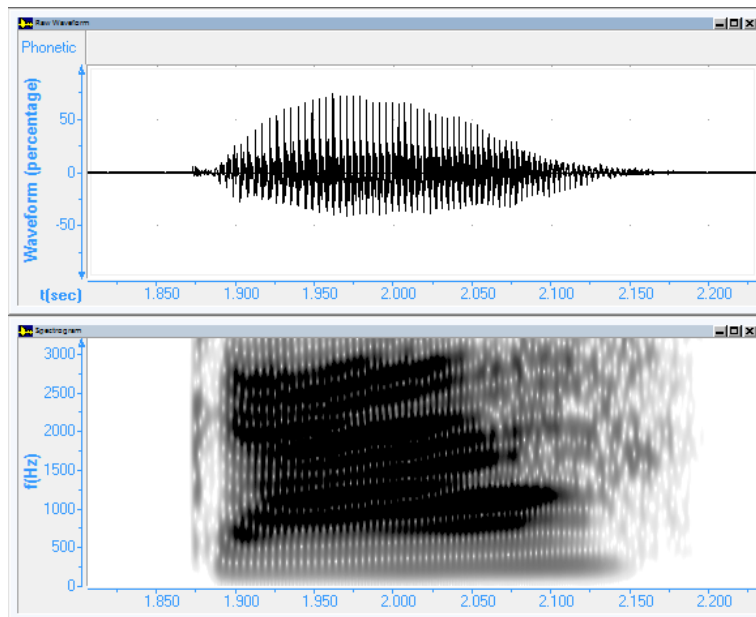
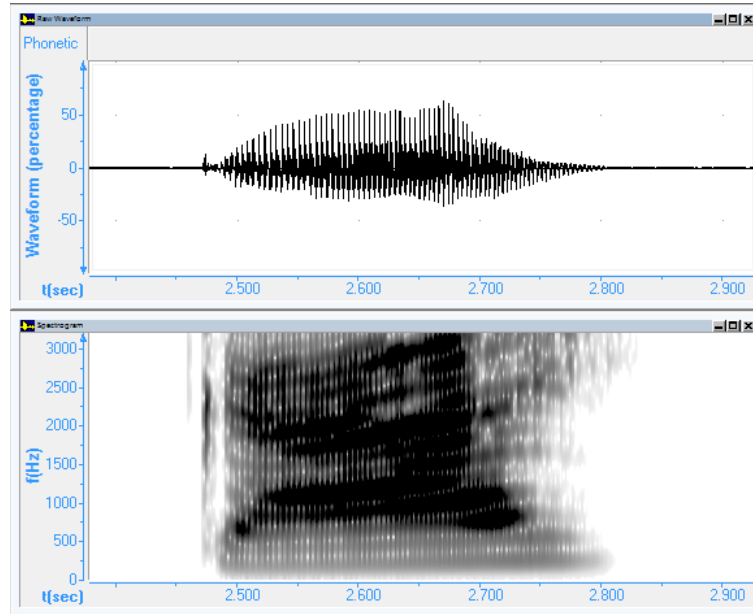


Figure 8: Waveform and spectrogram for *ka^o*

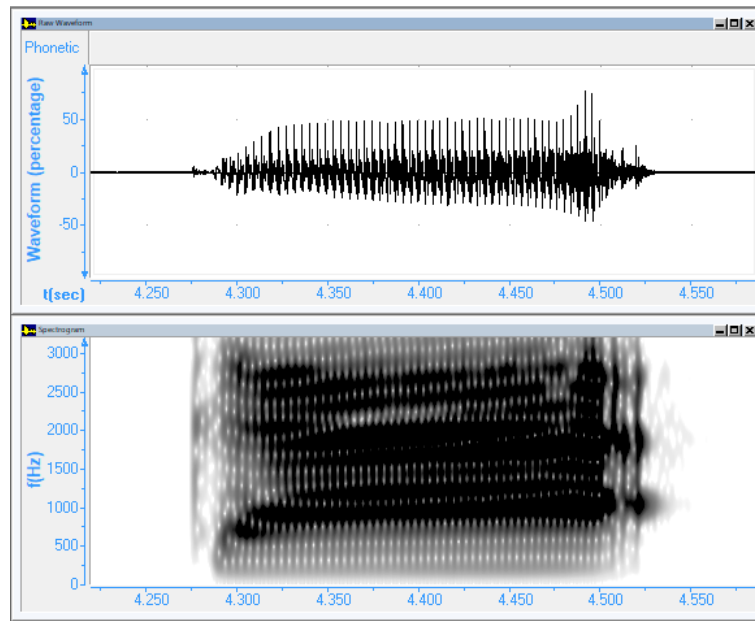
Diphthongs in syllables with final laryngeal consonants /-ʔ -h -j/ tend to be slightly longer than monophthongs, as is the pattern for all syllable types.

Measurements were also taken of vowel length in different syllable types recorded with framed words, and are given in Table 10.

Table 10: Average vowel length in milliseconds (range) for framed words

Syllable type	Monophthongs	Diphthongs
open	303 (289-324)	329 (298-355)
closed long	206 (180-249)	203 (170-242)
closed short	125 (88-160)	–
-ʔ	214 (162-263)	232 (216-279)
-h	165 (149-189)	215 (182-248)
-j	206 (182-225)	195 (167-217)

The measurements taken of words in a sentence frame showed that vowels in all syllable types are shorter in a frame. Vowels in open syllables are more strongly reduced than other syllable types, on average 61% of the length of words in isolation, probably due to not having an endpoint in isolated speech. Other syllable types, excluding open syllables, are reduced on average to 75% of the length of words in isolation, but the same general patterns of relative length for vowels in words in isolation hold true for words in the frame. This differs with Suwilai's (1987:13) observation that vowels in /ʔ/ final syllables are long in isolation but short in connected speech. Vowels in open syllables are clearly longest. In this smaller data set, syllables with final /ʔ/ are actually slightly longer than closed long syllables, although as only one measurement was made for each word this difference is not significant. After this come /h j/ final syllables of intermediate length and finally closed short syllables. See Figure 9 for waveform and spectrogram of the /ʔ/ final syllable *kaʔ* when recorded in a frame.

Figure 9: Waveform and spectrogram for *kaʔ* in frame

In conclusion, vowel length of monophthongs is contrastive in closed syllables, except where there is a laryngeal coda /ʔ h j/, in which case this contrast is neutralised. The average vowel length for /ʔ h j/ final syllables is intermediate, and closer to closed long syllables than closed short syllables. Monophthongs in open syllables and diphthongs in both open and closed syllables are always long, with diphthongs generally slightly longer than long monophthongs. These patterns clearly observed in words in isolation were reflected in framed words and are summarised with examples in Table 11.

Table 11: Examples of vowel length contrast and neutralisation

Vowel length	Syllable type	Examples
Contrastive	closed long	<i>tu:t</i> 'plant'
	closed short	<i>tuk</i> 'to tie up'
Always long	open monophthong	<i>pu:</i> 'empty husk'
	open diphthong	<i>pua</i> 'treat by incantation'
	closed diphthong	<i>tual</i> 'endpoint'
Always intermediate	ʔ final	<i>tuʔ</i> 'bump into'
	h final	<i>puh</i> 'to wash'
	j final	<i>tuj</i> 'froth'

7 Summary

The variety of Kmhmu' described in this paper exhibits no contrast of vowel phonation or tone, but has a rich segmental phoneme inventory of 36 consonants and 20 vowels. Oral stops at bilabial, alveolar, palatal and velar places of articulation show a three-way contrast of voiceless, voiced and voiceless aspirated. Nasal stops and approximants have voicing and preglottalisation distinctions, while liquids show voicing contrast only. The voiceless palatal approximant in final position is interpreted as an approximant rather than a fricative because it is realised with little turbulence. Although final /h/ and /j/ show articulatory and auditory similarity, the difference in their places of articulation is manifested in the vowel transition heard as the tongue moves to the palatal position for /j/ final syllables.

Kmhmu' has 10 distinctive vowel qualities each occurring in short and long forms, making a total of 20 vowel phonemes. Vowel length is distinctive for monophthongs in major syllables that are closed by oral and nasal consonants, but length contrast is neutralised in open syllables and in syllables closed by laryngeal consonants /ʔ h j/. Diphthongs are always treated as long vowels. The neutralisation of vowel length with final /j/ is thought to be due to the articulatory and auditory similarity to final /h/.

It is hoped that the data presented in support of these conclusions will contribute to comparative studies in other varieties of Kmhmu'.

Appendix A: Initial Wordlist

No.	Lao	Kmhmu' (Roman)	Phonemic	English gloss
1.	ປັງ (ໝໍ້)	kayh	<i>kaŋ</i>	‘to put away’
2.	ມາຍອອກ, ແກ້ອອກ	kah	<i>kah</i>	‘to untie’
3.	ໂຕປາ	ka'	<i>kaʔ</i>	‘fish’
4.	ກ້າຫານ	ka	<i>ka:</i>	‘brave’
5.	ຄາງ	kaap	<i>ka:p</i>	‘chin’
6.	ຊັ້ນ	kak	<i>kak</i>	‘gelatinous’
7.	ກ່ອນ	kaal	<i>ka:l</i>	‘before’
8.	ວັດແທກ	kal	<i>kal</i>	‘to measure’
9.	ຕັດ	kôh	<i>koh</i>	‘to cut off’
10.	ປ່ອມແຫ	kôôl (rep)	<i>ko:l (rəp)</i>	‘weighted bottom of a fishing net’
11.	(ຫຼັງ)ກົງ	kôl	<i>kol</i>	‘bent over’
12.	ລົບ	kôông	<i>ko:ŋ</i>	‘empty husk’
13.	ສົ້ນ	kôn	<i>kon</i>	‘skirt’
14.	ຍິ້ມ, ຫົວ	khayh	<i>kʰraŋ</i>	‘to laugh’
15.	ມ້າງ	khrah (gaang)	<i>kʰrah (ga:ŋ)</i>	‘to dismantle’
16.	ສຽງເຄື່ອງຕົກລົງ	khra'	<i>kʰraʔ</i>	‘sound of many things falling’
17.	ຊູດ, ລອກ	khraac	<i>kʰra:c</i>	‘to scrape’
18.	ຫວງໄວ້	khraang	<i>kʰra:ŋ</i>	‘to set aside’
19.	ຂັງ	khraŋ	<i>kʰraŋ</i>	‘to secure’
20.	ເຄື່ອງຂອງ	khrrwang	<i>kʰriaŋ</i>	‘things, belongings’
21.	ດື່ນແຄ້ວງ	pdayh	<i>p.daŋ</i>	‘to writhe’
22.	ຫວາປາງຊາງ	dah	<i>dah</i>	‘widely spaced’
23.	ທີ່	da'	<i>daʔ</i>	‘at, in, on, from, to’
24.	ທາ	da	<i>da:</i>	‘to paint’
25.	ທາງກ້ອງ	hndaak	<i>hn.da:k</i>	‘lower down’
26.	ຜົກວນຂວັນ	(hrôôy) dak	<i>(ro:j) dak</i>	‘a spirit entered (someone)’
27.	ເຖືອກ	daat	<i>da:t</i>	‘to side-swipe’
28.	ຖ້ວນ, ພໍດີ	dat	<i>dat</i>	‘exactly’
29.	ໂຕຈີຈຸ້ມ/ໂຕຈີກຸ້ມ	daang	<i>da:ŋ</i>	‘lizard’
30.	ວາແຂນ, ຈາງແຂນ	dang	<i>daŋ</i>	‘to spread arms out’

No.	Lao	Kmhmu' (Roman)	Phonemic	English gloss
31.	ແລນ	dar	<i>dar</i>	'to run'
32.	ສຸກເປື່ອຍ	(hnduum) pdaac	<i>(hn.du:m) p.da:c</i>	'overripe'
33.	ໂຍນ	dac	<i>dac</i>	'to toss'
34.	ປິດ (ປິດໝາກໄມ້)	tah	<i>tah</i>	'to pick'
35.	ທ້າວ	ta'	<i>taʔ</i>	'grandfather'
36.	ລົງກັນ	ta	<i>ta:</i>	'to challenge to a wager'
37.	ຄາຍອອກ	taak	<i>ta:k</i>	'to spit out'
38.	ຕິດ	tak	<i>tak</i>	'to stick to'
39.	ສູບ, ປັກ	tap	<i>tap</i>	'to pierce'
40.	ຫັກ, ສານ	taaŋ	<i>ta:n</i>	'to weave'
41.	ຕີ (ໃຊ້ໄມ້ຂ້ອນແຫລມຕີ)	tañ	<i>taŋ</i>	'to jab'
42.	ແປດ	taam	<i>ta:m</i>	'eight'
43.	ຕີກອງ	tam (rbaang)	<i>tam (r.ba:ŋ)</i>	'to beat a gong'
44.	ຮ້ອງ (ກະຮອກຮ້ອງ)	taar	<i>ta:r</i>	'to call a squirrel'
45.	ອ້າຍ/ເອື້ອຍ	taay	<i>ta:j</i>	'older sibling'
46.	ເກັບຜັກ	tay (hla' tmbri')	<i>taj (laʔ tm.briʔ)</i>	'to gather'
47.	ຟອດ	tuyh	<i>tuʃ</i>	'froth'
48.	ໃສ່ຮ້າຍປ້າຍສີ	tu	<i>tu:</i>	'to falsely accuse'
49.	ຕົ້ນ, ກົກ	tuut	<i>tu:t</i>	'plant'
50.	ມັດ	tuk	<i>tuk</i>	'to tie up'
51.	ໄຕ້ (ໄຟ)	tuuñ (phrwa)	<i>tu:n (p^hria)</i>	'to ignite (fire)'
52.	ອຸ່ນນ້ຳໃສ່ເຫຼົ້າໄທ ເຄື່ອງໂຕງນ້ຳ	tung (kdong)	<i>tuy</i>	'rice-wine drinking set'
53.	ຊັກ	puh	<i>puh</i>	'to wash'
54.	ຕີ	pu'	<i>puʔ</i>	'to hit'
55.	ລົບ (ແກ່ນລົບ)	pu	<i>pu:</i>	'empty rice husk'
56.	ເມກ	puut	<i>pu:t</i>	'fog'
57.	ດັບ (ໄຟ)	put (phrwa)	<i>put (p^hria)</i>	'to extinguish(fire)'
58.	ຮ້າໄຮ່	puur	<i>pu:r</i>	'to clean up ricefield'
59.	ສຽງນົກບິນປີນໄປ	pur	<i>pur</i>	'sound of bird flying'
60.	ນອນຕາຍຢູ່ລ້າ	royh	<i>rɔʃ</i>	'to lie around'
61.	ເລາະໄປ	roh	<i>rɔh</i>	'to go along beside'
62.	ເຜົ່າຂມຸທີ່ອາໄສຢູ່ແຂວງ ອຸດົມໄຊ	(Kmhmu') rook	<i>(km.muʔ) rɔ:k</i>	'Kmhmu' group in Udomxay'

No.	Lao	Kmhmu' (Roman)	Phonemic	English gloss
63.	ຮອງ(ພື້ນ)	roong	<i>roːŋ</i>	'to line with leaves'
64.	ນ້ຳທຳມະດາ	(ôm) rong	<i>(ʔom) roŋ</i>	'untreated'
Diphthongs				
65.	ກິ່ນຂົວ	wayh	<i>ʔiaj</i>	'to stink'
66.	ບິດຕົນຕົວ	rm'iah	<i>rm.ʔiah</i>	'to roll (oneself) over'
67.	ໂງ່	ia'	<i>ʔiaʔ</i>	'stupid'
68.	ຫວານ	h'ia	<i>ha.ʔia</i>	'sweet'
69.	ຂີ້	iak	<i>ʔiak</i>	'excrement'
70.	ສຽງດັງຄະລະ	iac	<i>ʔiac</i>	'sound of passing through thick forest'
71.	ອຳໄວ້	iat	<i>ʔiat</i>	'to keep secret'
72.	ໂຕອຽນ	ian	<i>ʔian</i>	'eel'
73.	ໄກ່	h'iar	<i>hi.ʔiar</i>	'chicken'
74.	ເຊື້ອສາຍ	jwa	<i>ʔia</i>	'lineage, family line'
75.	ຕີນ	jwang	<i>ʔianŋ</i>	'foot, step'
76.	ໂຕຟານ	puayh	<i>puaj</i>	'deer'
77.	ເຢົາ	pua	<i>puə</i>	'treat by incantation'
78.	ຜັກທຽມ	puang	<i>puanŋ</i>	'garlic'
79.	ຫຼາຍ	rwañ	<i>riaŋ</i>	'many'
80.	ຮາກໄມ້	riah	<i>riah</i>	'root'
81.	ຫ້ອຍເປັນແຖວ	sk-riak	<i>sk.riak</i>	'hanging in rows'
82.	ຮັດເຂົ້າ	hriat	<i>ʔiat</i>	'to tighten'
83.	ລັກແບ່ງຫນ່ວຍຫນຶ່ງ	riam (uun)	<i>riam (ʔuːn)</i>	'take a portion'
84.	ຕາຍ	haan	<i>haːn</i>	'to die'
85.	ໄໝ້	ha'	<i>haʔ</i>	'to be burnt'

Appendix B: Additional Wordlist

No.	Lao	Kmhmu' (Roman)	Phonemic	English gloss
1.	ອົບເອົ້າ	rm'uah	<i>rm.ʔuah</i>	'humid'
2.	ອ້າຍເຂີຍຫຼີ້ນອງເຂີຍ	sia'	<i>siaʔ</i>	'sister's husband'
3.	ຫມອນ	krmwayh	<i>kr.niaj</i>	'shattered'
4.	ຫວີ	jriah	<i>ʔriah</i>	'comb'
5.	ຮາກອົວະງ	ua'	<i>ʔuaʔ</i>	'sound of vomiting'
6.	ຝົນເອື້ອນ	rwayh	<i>riaj</i>	'to cease'
7.	ແມ່ລູກອ່ອນເປື້ອອາຫານ	smpwa'	<i>smpwaʔ</i>	'to violate a taboo'

No.	Lao	Kmhmu' (Roman)	Phonemic	English gloss
8.	ຕະພັນ	sruayh	<i>sruaɰ</i>	‘to nudge with the toe’
9.	ຍິວະ	ñua'	<i>ɲuaʔ</i>	‘to trick’
10.	ດູດ (ໝູດູດ)	muayh	<i>muaj</i>	‘to poke with the snout’
11.	ເປືອກໄມ້ຊະນິດໜຶ່ງໃຊ້ຮຽງໝາກ	klciah	<i>kl.ciah</i>	‘chewable tree bark’
12.	ຍໍເບື້ອງໜຶ່ງຂຶ້ນ	vwayh	<i>wiaɰ</i>	‘to lift off’

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Reviewed: Received 1 August 2018, revised text accepted 5 September 2018, published 10 October 2018

Editors: Editor-In-Chief Dr Mark Alves | Managing Eds. Dr Paul Sidwell, Dr Nathan Hill, Dr Sigrid Lew